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(11) Publication number:

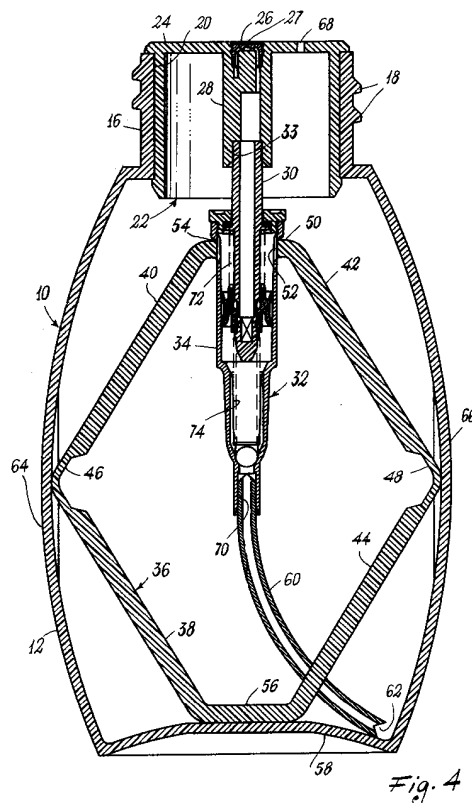
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EUROPEAN PATENT APPLICATION(21) Application number: **93100845.2**(51) Int. Cl.⁵: **B05B 11/04, B05B 11/00**(22) Date of filing: **21.01.93**(30) Priority: **28.02.92 IT MI920452**(43) Date of publication of application:
01.09.93 Bulletin 93/35(84) Designated Contracting States:
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I-20129 Milano (IT)(54) **Atomizer bottle with pump operable by squeezing.**

(57) The atomizer bottle (10; 110), operable by manual squeezing, comprises in addition to the actual bottle (12, 112) containing the liquid to be atomized an atomizer capsule (22; 122) which closes the mouth (20; 120) of the bottle (12; 112). In the capsule (22; 122) there is inserted an atomization insert (26; 126) comprising a nozzle (27; 127) from which the atomized liquid emerges. The atomizer bottle (10; 110) also comprises a conventional pump (32; 132) with the relative dip tube (60; 160).

The pump (32; 132) is enclosed within the bottle (12; 112) and is operable by axially pressing a hollow shaft (30; 130) projecting from it. The hollow shaft (30; 130) of the pump is rigid with the capsule (22; 122), and the interior of the shaft (30; 130) communicates with the nozzle (27; 127). Means (36; 136) for operating the pump (32; 132) as a consequence of squeezing the bottle (12; 112), and means for maintaining the free end (62; 162) of the dip tube (60; 160) adjacent to the base (58; 158) of the bottle (12; 112) under all conditions are provided.



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This invention relates to atomizer bottles operable by squeezing the bottle. Such bottles are generally known as squeeze bottles.

In addition to the actual bottle containing the liquid substance to be atomized, these known atomizer bottles comprise an atomizer capsule which closes the bottle mouth. A conventional atomization insert comprising a nozzle from which the atomized liquid emerges is inserted into the centre of said atomizer capsule, the nozzle being connected to a dip tube, one end of which is connected to the capsule whereas its other end opens adjacent to the base of the bottle. For operational reasons the bottle is only about half filled, the remainder being occupied by air.

The bottle is of elastically deformable plastics material, so that the bottle can be easily deformed by squeezing it with one hand.

This causes a certain quantity of atomized liquid to emerge from the nozzle of the atomizer capsule. In certain known atomizer bottles, the deformability of the bottle is limited to at least one predetermined region, so that if the other regions of the bottle are pressed there is no discharge of atomized liquid.

Generally the bottle comprises two deformable regions arranged opposite each other to facilitate its squeezing by the hand gripping the bottle. The bottle is normally formed by blow-moulding. A closure cap is usually also provided to be screwed onto the neck of the bottle.

The atomizer bottles of the aforesaid type have however various drawbacks.

Firstly the quantity of substance which is atomized each time the bottle is squeezed reduces, for equal squeezing force, as the level of liquid substance contained in the bottle reduces.

In addition the atomization achieved is rather poor. In this respect the liquid particles of the spray obtained on squeezing the bottle vary considerably in size, with some being in the form of actual droplets.

Finally as the quantity of liquid substance contained in the bottle reduces, the force which has to be exerted on the bottle increases.

The object of the present invention is to obviate said drawbacks of atomizer bottles of the aforescribed type.

This object is achieved according to the present invention by an atomizer bottle which, in addition to the actual bottle containing the liquid to be atomized and being elastically deformable by squeezing with one hand, comprises an atomizer capsule which closes the bottle mouth, in said capsule there being inserted an atomization insert comprising a nozzle from which the atomized liquid emerges, and is characterised by further comprising: a conventional pump with the relative dip tube,

the pump being of the type operable by axially pressing a hollow shaft projecting from it, said pump being enclosed within the bottle, the hollow shaft of the pump being rigid with said capsule, and the interior of the shaft communicating with the exit nozzle for the atomized liquid; means for operating the pump as a consequence of squeezing the bottle; and means for maintaining the free end of the dip tube adjacent to the base of the bottle under all conditions.

Conveniently, said means for operating the pump as a consequence of squeezing the bottle consist of an elastically deformable plastics frame of overall rhombic form positioned in the bottle such that an axis of the rhombus coincides with the pump axis, the first of the two angles of the rhombus which lie on said axis being rigid with the pump body and the second being in contact with the substantially rigid base of the bottle, the other two angles of the rhombus being in contact with respective opposing points on the side wall of the bottle, at least one of said two opposing points forming part of a region of the bottle side wall which is deformable by squeezing.

An extremely simple manner of achieving said means for maintaining the free end of the dip tube always adjacent to the base of the bottle is to make this tube, which is elastically flexible, of such a length that even when the pump body is in its position closest to the atomizer capsule, the end of the tube is still adjacent to the base of the bottle.

The pump can be of the most traditional type, comprising two metal springs for returning it to its rest state, and a non-return valve of metal ball type at that end of the pump to which the dip tube is fixed. Such a pump is described for example in US-A-4,228,931 and in US-A-4,434,916.

If an "ecological" bottle is required, in the sense of a bottle of which all the constituent material can be easily salvaged when empty, a pump can be used of the type described in Italian patent application No. M191A 003357 of the present applicant.

This pump has no metal parts and in fact is formed completely of plastics material of one and the same type. It is therefore sufficient to make all the other constituent parts of the atomizer bottle of the same type of plastics material as used for the pump, for the bottle to be completely and conveniently salvageable once the last dose of atomized liquid has been dispensed.

The invention will be more apparent from the description of two embodiments thereof given hereinafter by way of example only. In this description reference is made to the accompanying drawings, in which:

Figure 1 is a side view of a first embodiment of the invention;

Figure 2 is a view thereof in a direction perpendicular to that of Figure 1;

Figure 3 is a top plan view thereof;

Figure 4 is an enlarged vertical axial section on the line 4-4 of Figures 1 and 3 showing the bottle without the closure cap;

Figure 5 is a side view of a second embodiment of the invention;

Figure 6 is a view thereof in a direction perpendicular to that of Figure 5; and

Figure 7 is an enlarged vertical axial section on the line 7-7 of Figure 5, showing the bottle without the closure cap.

From Figures 1 to 4 it can be seen that the atomizer bottle 10 comprises an actual bottle 12 and a cylindrical atomizer capsule 22 which closes the circular mouth 20 of the bottle 12. The capsule 22 is protected by a cap 14 (visible in Figures 1-3) comprising an internal thread which enables it to be screwed onto the neck 16 (Figure 4) of the bottle 12 because of the presence of a corresponding external thread 18 on this neck. The capsule 22 comprises an upper transverse wall 24 the outer surface of which is provided with a coaxial cavity into which there is inserted a conventional atomization insert 26 the nozzle 27 of which communicates with the interior of a hollow cylindrical projection 28 extending downwards from the wall 24 coaxially to the insert 26. In a suitable seat 32 provided in the lower end of the cylindrical projection 28 there is inserted the upper end of a hollow shaft 30 of a conventional pump 32, of the type widely used for dispensing liquid or creamy substances contained in bottles and operable by coaxially pressing the hollow shaft 30 projecting from the body 34 of the pump 32. In normal known applications the shaft of such a pump carries on its top end a dispensing knob provided with an atomization insert, the nozzle of which communicates with the interior of the shaft.

In the present example (see Figure 4) the shaft 30 of the pump 32 is press-fitted into the seat 32 of the cylindrical projection 28 of the atomization capsule 22, so that the shaft 30 remains fixed relative to the bottle 12.

The hollow body 34 of the pump 32 is fixed to a frame 36 of approximately trapezium form, constructed of elastically deformable plastics material. This rhombic frame 36 behaves largely as an articulated quadrilateral, comprising four arms 38, 40, 42, 44. The arm 38 is connected to the arm 40 by a connection strip 46 of lesser thickness than the arms and integral with them.

Likewise the arms 42 and 44 are connected together by a connection strip 48. The connectors 46 and 48 in practice form a simple hinge.

The upper end of the arms 40 and 42 is integral with an annular connection element 50

comprising a hole 52 for forcedly receiving the intermediate part of the body 34 of the pump 32. This latter is hence forced into the hole 52 until the element 50 rests against the shoulder 53 provided on the body 34 of the pump 32.

Figure 4 shows the atomizer bottle 10 and pump 32 in the rest condition.

In this figure it can be seen that the lower arms 38 and 44 of the frame 36 are connected together at their lower end by a horizontal piece 56 which rests on the substantially rigid base 58 of the bottle 12.

In the lower end 70 of the pump 32 there is inserted a dip tube 60, the lower end 62 of which opens adjacent to the inner wall of the substantially rigid base 58 of the bottle 12.

The side wall of the bottle 12 comprises two opposing regions 64, 66 which are elastically deformable inwards by pressing with the fingers of the hand which grips the atomizer bottle 10. As is apparent, by simultaneously pressing against the two deformable regions 64, 66, the trapezium frame 36 is squeezed in a direction perpendicular to the axis of the pump 32, so that the two connection strips 46 and 48 approach each other. Consequently the element 50 of the frame 36 is urged upwards dragging with it the body 34 of the pump 32. As the shaft 30 of the pump 32 remains fixed relative to the bottle 12, the pump undergoes operation and if previously primed causes a predetermined quantity of the liquid substance contained in the bottle 12 to emerge from the nozzle 27 of the atomization insert 26 in a conveniently atomized form.

When pressure on the deformable regions 64 and 66 ceases, the situation shown in Figure 4 (rest condition) is automatically restored by virtue of the helical springs 72 and 74.

It should be noted that as a result of the pressure exerted by the fingers on the regions 64 and 66 of the bottle 12, not only does the pump body 34 move upwards, but the dip tube 60 is also dragged upwards. This latter, of elastically deformable plastics material, must therefore be of such a length that even when the body 34 of the pump 32 is at the highest point of its travel, the lower end 62 of the dip tube 60 is still adjacent to the base 58 of the bottle 12. To achieve this it is merely necessary to suitably increase the length of the tube 60 beyond that which would be sufficient in the rest state. In this latter state the tube 60 is in the situation shown in Figure 4, whereas when the body 34 of the pump 32 is in its condition of maximum upward travel, the lower end of the dip tube 60 is in a position more towards the centre of the base 58 of the bottle 12, but still in contact with the base 58. For completeness, it should be noted that in order to replace with an equal volume of air

the liquid substance withdrawn from the bottle 12 each time the pump is operated, the capsule 24 is provided with a hole 68 so that a vacuum is not created within the bottle 12.

In the particular example of the atomiser bottle 10, the actual bottle 12 is conveniently formed by blow moulding.

Figures 5-7 show a modification of the atomizer bottle, in which the actual bottle 112 is formed by injection moulding. In these figures parts equal or similar to those of Figures 1-4 are indicated by the same reference numerals plus 100.

The atomizer bottle 110, of overall cylindrical form, uses a pump 132 totally of plastics construction, such as that described in the stated Italian patent application M191A003357. The pump 132 is preferably constructed of polyethylene, a plastics material available as low density polyethylene (LDPE), very low density polyethylene (LLDPE) and high density polyethylene (HDPE).

Consequently if the bottle 112, the elastically deformable frame 136 and the capsule 112 are also constructed of polyethylene (or suitable density), an atomizer bottle 110 is obtained which once empty can be totally and conveniently salvaged, and which for this reason could be defined as ecological.

Specifically, the bottle 112, the capsule 122 with its insert 126 and the frame 136 are of low density polyethylene (LDPE). From tests carried out, it has been shown that the atomizer bottles of the present invention do not have any of the drawbacks of known pumpless atomizer bottles.

In this respect, besides dispensing at each operation (squeezing of the bottle) a predetermined constant quantity of atomized liquid substance, the atomizer bottle according to the invention achieves excellent atomization because of the presence of the pump. In addition, the squeezing force required to obtain discharge of the predetermined quantity of atomized liquid substance is always the same, until it has been totally consumed.

Claims

1. An atomizer bottle (10; 110) operable by manual squeezing which, in addition to the actual bottle (12, 112) containing the liquid to be atomized and being elastically deformable by squeezing with one hand, comprises an atomizer capsule (22; 122) which closes the mouth (20; 120) of the bottle (12; 112), in the capsule (22; 122) there being inserted an atomization insert (26; 126) comprising a nozzle (27; 127) from which the atomized liquid emerges, and is characterised by further comprising; a conventional pump (32; 132) with the relative dip tube (60; 160), the pump being of the type

operable by axially pressing a hollow shaft (30; 130) projecting from it, said pump (32; 132) being enclosed within the bottle (12; 112), the hollow shaft (30; 130) of the pump being rigid with said capsule (22; 122), and the interior of the shaft (30; 130) communicating with the nozzle (27; 127); means (36; 136) for operating the pump (32; 132) as a consequence of squeezing the bottle (12; 112); and means for maintaining the free end (62; 162) of the dip tube (60; 160) adjacent to the base (58; 158) of the bottle (12; 112) under all conditions.

2. An atomizer bottle (10; 110) as claimed in claim 1, wherein the means for operating the pump (32; 132) as a consequence of squeezing the bottle (12; 112) consist of an elastically deformable plastics frame (36; 136) of overall rhombic form positioned in the bottle (12; 112) such that an axis of the rhombus coincides with the axis of the pump (32; 132), the first (50; 150) of the two angles of the rhombus which lie on said axis being rigid with the hollow body (43; 134) of the pump (32; 132) and the second (56; 156) being in contact with the substantially rigid base (58; 158) of the bottle (12; 112), the other two angles (46, 48; 146, 148) of the rhombus being in contact with respective opposing points on the side wall of the bottle (12; 112), at least one of said two opposing points forming part of a region (64, 66; 164, 166) of the side wall (12; 112) which is deformable by squeezing.
3. An atomizer bottle (10; 110) as claimed in claim 1 or 2, wherein the means for maintaining the free end (62; 162) of the dip tube (60; 160) adjacent to the base (58; 158) of the bottle (12; 112) are to make this dip tube (60; 160) of such a length that the free end (62; 162) of the tube remains adjacent to the base (58; 158) of the bottle (12; 112) under all conditions.

4. An atomizer bottle (110) as claimed in any one of the preceding claims, wherein the pump (132) consists totally of plastics material of one and the same type, the other parts of the atomizer bottle also consisting of this type of plastics material.

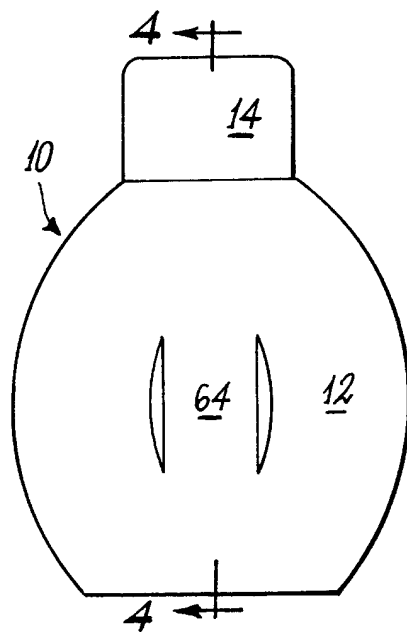


Fig. 1

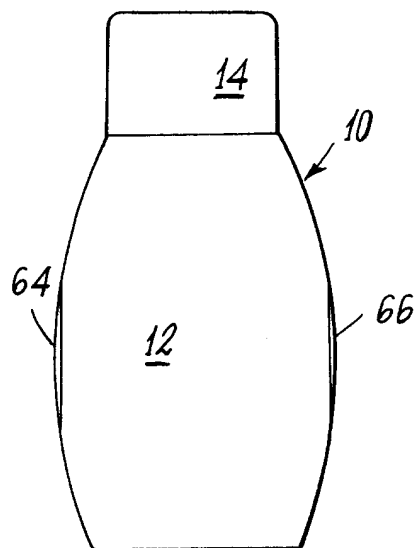


Fig. 2

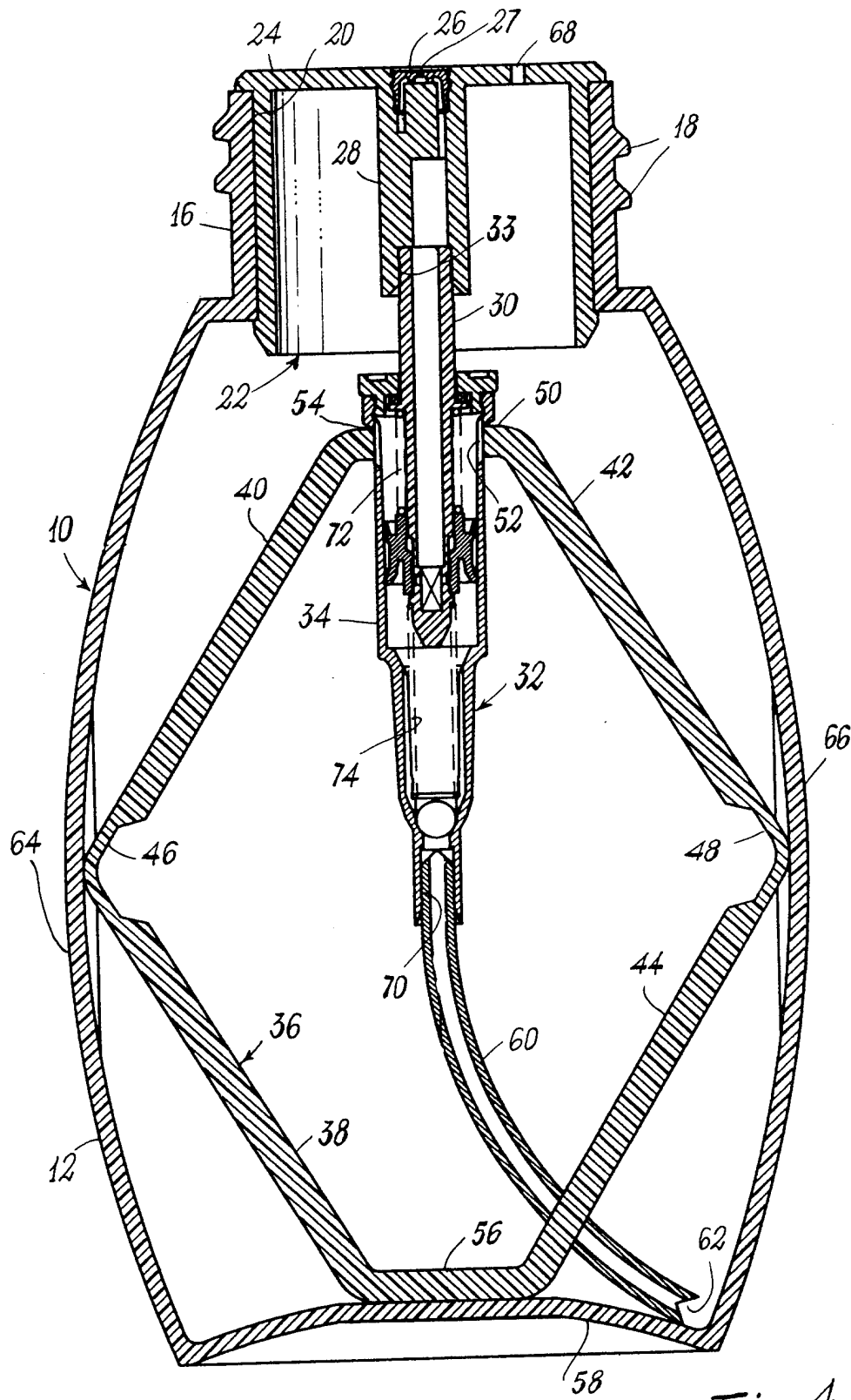
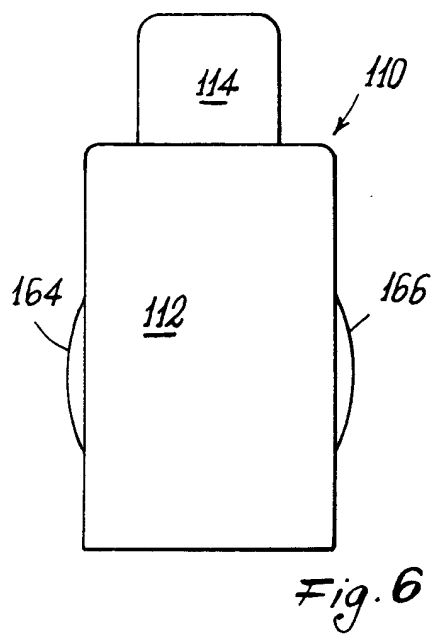
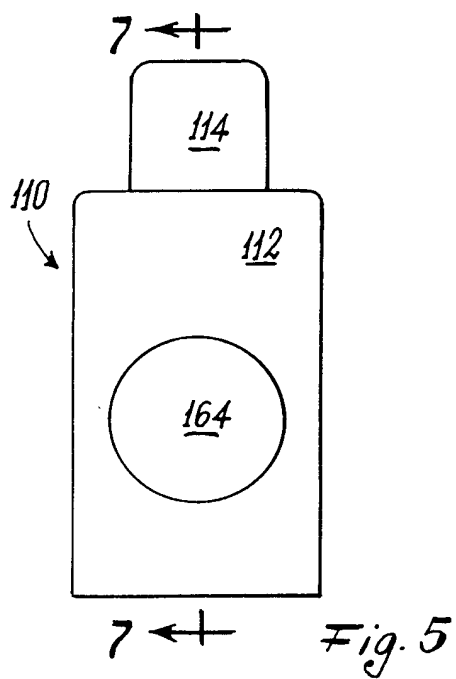
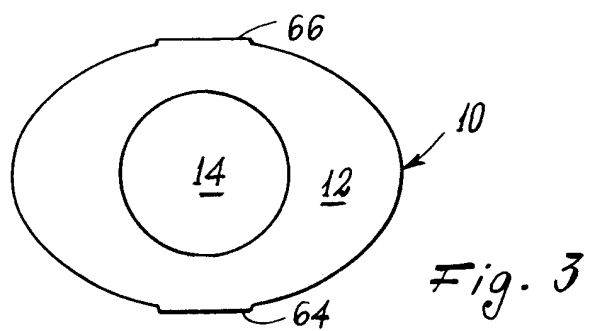


Fig. 4



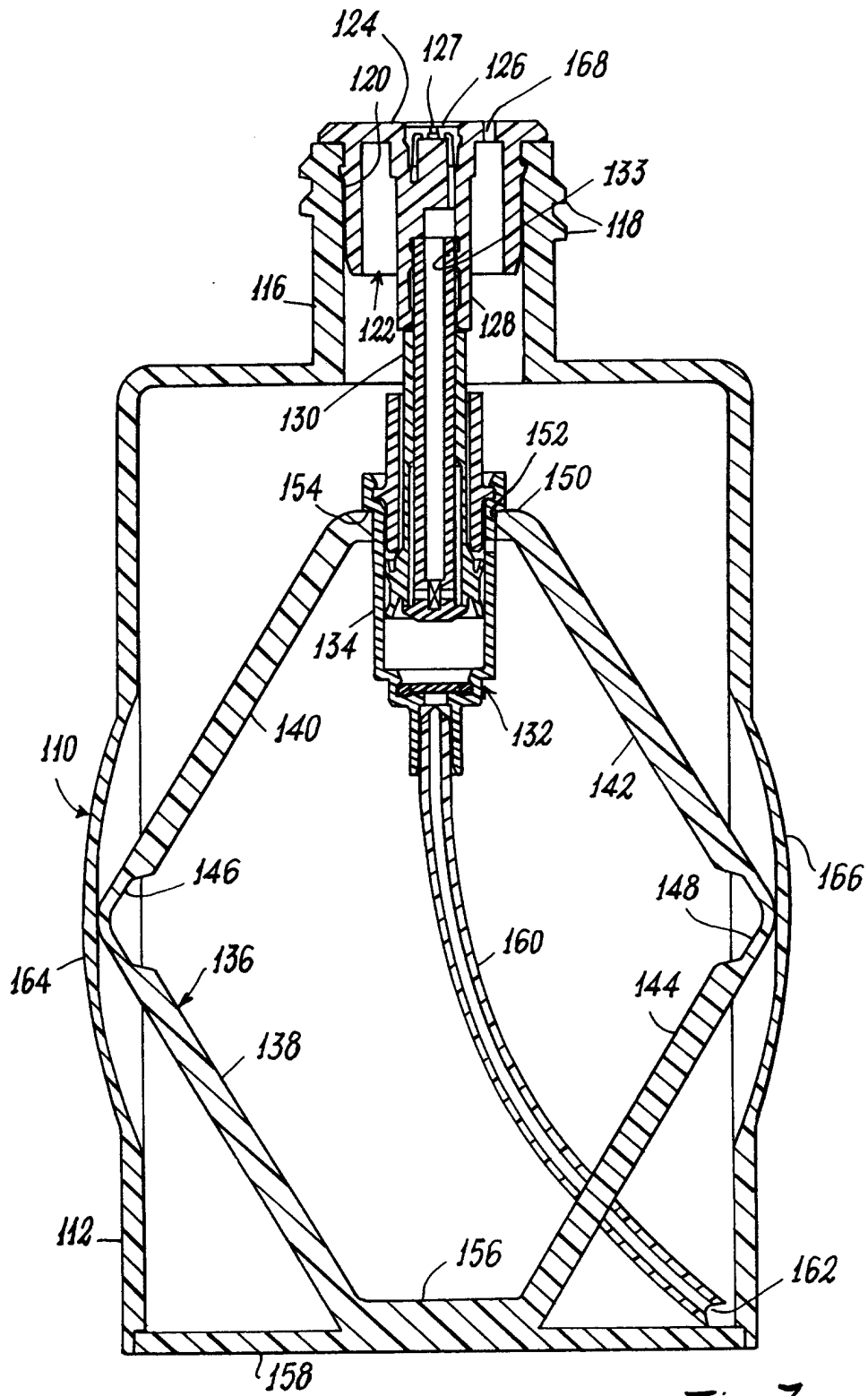


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 0845

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 603 794 (DEFORD ET AL) * column 2, line 37 - line 62 *	1	B05B11/04 B05B11/00
A	WO-A-9 008 073 (BATELLE MEMORIAL INSTITUTE) * page 8, line 5 - page 11, line 26 *	1	
A	GB-A-2 184 493 (PENTEL KABUSHIKI KAISHA) * page 2, line 98 - page 3, line 112 *	1	
A	WO-A-9 101 255 (LVMH RECHERCHE) * the whole document *	2	
A	US-A-4 437 588 (SHAY) * column 8, line 45 - line 61 *	3	
A	EP-A-0 253 495 (BLAIREX LABORATORIES INC.) * page 5, line 1 - line 4 *	4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B05B F04B B65D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 APRIL 1993	Examiner JUGUET J.M.
CATEGORY OF CITED DOCUMENTS			
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